

Improving Resilience and Efficiency of the US Transmission Grid

US DOE Transmission Congestion Study Meeting
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Transmission's Resilience, Reliability, and Economic Benefits

- 3:1 Benefit:Cost ratios from recent regional transmission.
- Seam study 2.5 to 3.3 to 1 Benefit/cost
 - Could black start large regions of the country
- Major EHV overlay could reduce bills 10%
 - <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2921.html>,
<https://www.utilitydive.com/news/study-deep-decarbonization-of-us-grid-possible-without-energy-storage/412721/>
- Transmission is most versatile resilience option

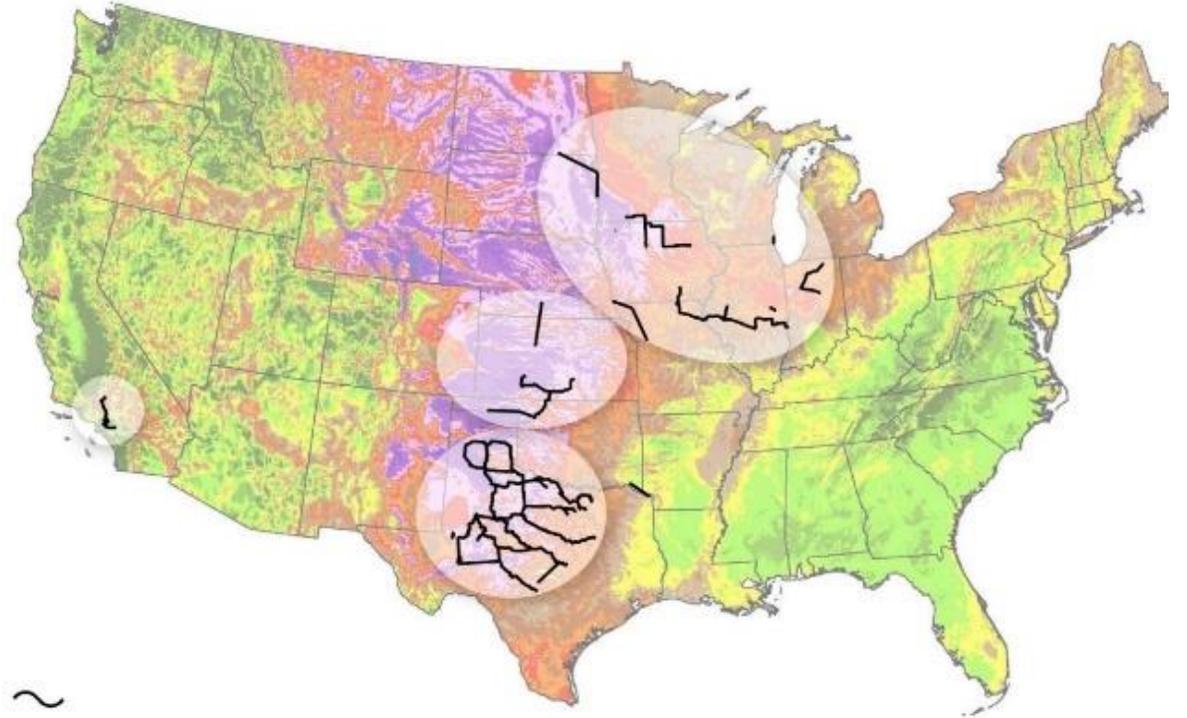
Congestion costs in IMM reports, in millions of dollars

	2017	2016
MISO	\$1,503	\$1,400
PJM	\$698	\$1,024
ERCOT	\$967	\$497
NYISO	\$481	\$529
SPP	\$506	\$280
CAISO	\$180	\$142
into CAISO	\$114	\$92
ISO-NE	\$41	\$39
Total	\$4,490	\$4,003



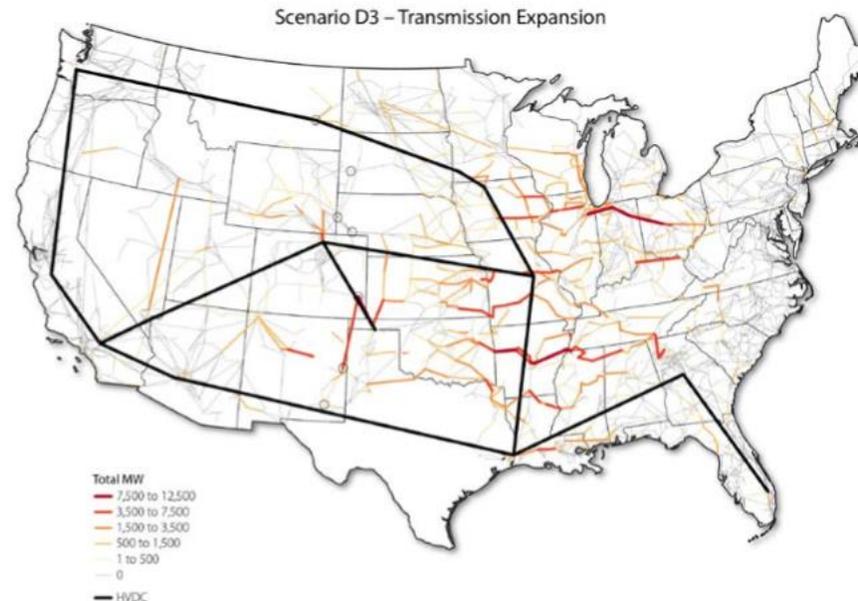
It Can Be Done: Recent Large Scale Expansions

- MISO MVP, SPP priority projects, ERCOT CREZ
- **Winning formula:**
 - Pro-active multi-benefit planning
 - Broad, beneficiary pays cost allocation



Barrier 1: Permitting

- State by state review
- States impacting other states, national interest not being considered



Barrier 2: Narrow planning

- Almost no inter-regional plans have been produced
- Planning by RTOs and EIPC has been ground-up rather than comprehensive
- Planning has not been pro-active to consider known generation development in resource areas
- Planning benefits have been compartmentalized: economic/reliability/resilience/generator interconnection



Barrier 3: Cost allocation

- FERC generator interconnection policy allowed participant funding
 - Even when many generators are connecting in the same area
- Benefits are broad



Solution 1: Use the Existing Grid More Efficiently

- **Power Flow Control**
 - Push and pull power, modular, scalable, movable
- **Dynamic Line Ratings**
 - Adjust path rating based on ambient conditions, allows capacity forecasting
- **Topology Optimization**
 - Software to optimize transmission assets, eg circuit breakers
- **Storage as Transmission**
- **DOE: R&D, pilots, development of tools and methods for planners**
- **FERC: regulatory oversight, remove disincentive, planning guidance**



Solution 2a: Broad pro-active regional planning

- Consider all benefits
- Pro-actively incorporate known developments in resource areas
- Probabilistic, to consider uncertainty and insurance value
- DOE: Support planning studies, tools, and methods
 - Congestion study assist in quantifying benefits and value, provide methodology for applicants interested in corridor designation



Solution 2b: Inter-regional planning

- **Fix the “triple hurdle” problem through:**
 - Common model, benefits metrics between pairs of planning authorities
 - Ex ante cost allocation policy
 - Consider all benefits even if they are different in each region
- **DOE can support with data, studies, and technical assistance**
 - In particular with states between the source and sink



Solution 3: Support Permitting

- **National Interest Electric Transmission Corridors**
 - DOE should consider an application-based program, putting the burden on the developer to demonstrate a line meets the criteria
 - DOE should provide guidance on how to meet those standards



Solution 4: Broad beneficiary pays cost allocation

- Consider all benefits
- As they may change over time
- FERC assign costs to all beneficiaries

